




## Third Agreed Order 5-Year Review

Red Penn Landfill  
Pewee Valley, Kentucky

December 2015

*Prepared on Behalf of  
Waste Management, Inc., and Ford Motor Company*



*[Signature]*  
12/8/15  
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# Section 1

## Introduction

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### 1.1 Background

The Red Penn Landfill is located in Oldham County, Kentucky. Waste Management, Inc. (Waste Management), and Ford Motor Company (Ford) have been implementing the remedy for the Red Penn Landfill in accordance with the Scope of Work (SOW) (Waste Management, 1998), which is contained in an Agreed Order (KDWM, 1999).

As described in the SOW, the major components of the remedy for the site are as follows:

- Installation and maintenance of a multi-layer landfill cover
- Installation and maintenance of access controls
- Evaluation of leachate head within the landfill
- Implementation of annual groundwater/surface water monitoring

Remedial action (RA) construction activities began at the site on May 5, 2000, and were substantially completed by September 20, 2000. Following the completion of the construction activities, operation, maintenance, and monitoring (OM&M) activities commenced in January 2001 and continued through October 2005. The OM&M portion of the RA for the site includes activities such as inspections of the final cover system and site monitoring networks, general maintenance, and leachate head and groundwater/surface water monitoring.

The annual OM&M reports for 2001 through 2005, which document the activities performed during each annual reporting period, were prepared in accordance with the Post-Construction Performance Standards Verification Plan (PSVP) (Section 3 of the Final Remedial Design document) (RMT, October 1999) and the Operation, Monitoring, and Maintenance Plan (Appendix G of the Final Remedial Design). The purpose of these reports was to provide documentation of the OM&M activities that were performed during each annual reporting period following the installation of the upgraded final cover. The annual monitoring reports were submitted previously to the Kentucky Division of Waste Management or its predecessor, the Kentucky Natural Resources and Environmental Protection Cabinet, (collectively, the KDWM), and are also included in electronic format in Appendix A of this document.

The first 5-year review was performed for the period of January 2001 through December 2005, and covered the 5 years of monitoring leachate head, groundwater, and surface water, and conducting site inspections.

The second 5-year review was performed for the period of January 2006 through December 2010 and documented the results of the site inspections, maintenance performed, and the surface water and groundwater monitoring results. Additional items requested in a February 26, 2007, letter from the KDWM were also addressed in the Second 5-Year Review Report.

## **1.2 Purpose and Scope**

The scope of this third 5-year review of the remedy covers the period from January 2011 through December 2015, and documents the results of the site inspections, maintenance performed, and the surface water and groundwater monitoring results.

The effectiveness of the RA was evaluated by (1) reviewing the objectives contained in the SOW to address the potential threats to human health and the environment (identified in the Risk Assessment) (CDM, 1993), (2) summarizing the remedial actions that have been implemented to meet these objectives (refer to the Construction Documentation Report) (RMT, 2000), and (3) assessing the findings of the OM&M activities to determine if the objectives have been met.

## **1.3 Report Organization**

The organization of this report generally follows the USEPA's Comprehensive Five-Year Review Guidance (USEPA, 2001), with modification to address the requirements of the Agreed Order. The following sections present the site chronology and background information, the remedial actions selected and implemented, and the review process and its findings and conclusions.

## Section 2

# Site Chronology

A summary of the site chronology, including a history of operational and regulatory activities from the early 1940s to 2015, is presented in the following table:

**History of Operational and Regulatory Activities  
Red Penn Landfill - Pewee Valley, Kentucky**

DATE	ACTIVITY
Early 1940s	Site began accepting waste.
March 1, 1954	Site was leased as "dump ground" by Bert Logsdon and Chris P. Pennington.
November 6, 1959	Landfill permit was granted to the Red Penn Sanitation Company by the Oldham County Health Department.
March 1, 1962; July 27, 1964; September 14, 1964	Red Penn Sanitation Company purchased portions of the property now known as the Red Penn Landfill.
December 4, 1968	An Operation Permit to operate a sanitary landfill was granted to the Red Penn Sanitation Company by the Kentucky Department of Health.
January 29, 1970	Red Penn Sanitation Company purchased property to the west of the current site for use as a soil borrow area.
1972 to 1982	Red Penn Sanitation Company was cited for violations by the Kentucky Division of Solid Waste, which is now referred to as the Kentucky Division of Waste Management (KDWM) under the Natural Resources and Environmental Protection Cabinet.
1978	Red Penn Sanitation Company sold a 3.74-acre portion of the site to an employee, Fred Northup.
March 17, 1986	The KDWM was notified that suspected hazardous waste had been found at the site.
March 31, 1986	The KDWM collected soil samples from the drums and soil at the entrance to the landfill.
May 27, 1986	The KDWM completed a preliminary assessment report.
July 2, 1986	The KDWM initiated a site investigation at the landfill.
July 22, 1986	The State of Kentucky filed a Notice of Violation against the Red Penn Sanitation Company concerning removal of waste discovered on-site.
October 29, 1986	The KDWM completed the site investigation report.
September to October 1986	Drums and soil were removed from the entrance of the landfill and the drum excavation area.
December 1, 1986	The final permit for operation of the Red Penn Landfill expired.

**History of Operational and Regulatory Activities (continued)**  
**Red Penn Landfill - Pewee Valley, Kentucky**

DATE	ACTIVITY
April 1987	The KDWM requested voluntary cooperation of several parties responsible for the disposal of hazardous waste at the landfill.
August 14, 1987	The KDWM ordered that the landfill be closed in accordance with Kentucky statutes and regulations.
August 27, 1987	The Red Penn site was given a Hazard Ranking System score of 38.1.
March 31, 1989	The Red Penn Landfill was placed on the National Priorities List.
September to October 1989	An investigation was conducted by the United States Environmental Protection Agency (USEPA) Region IV Emergency Response Contractor (Weston TAT).
September 14, 1990	A preliminary health assessment was issued by the Agency for Toxic Substances and Disease Registry.
September 11, 1990	The USEPA issued a work assignment to CDM Federal Programs Corporation to conduct the Remedial Investigation for the Red Penn site.
June 18, 1993	CDM Federal Programs Corporation submitted the Revised Draft Remedial Investigation Report to the USEPA.
April 7, 1994	The KDWM met with several "potentially responsible parties" (PRPs) regarding performance of remedial activities at the site.
August 29, 1994	Several of the PRPs (Waste Management, Ford, and ARCO) submitted to the KDWM a Scope of Work (SOW).
Spring/Summer 1995	A revised SOW was submitted to the KDWM on April 7, 1995, and approved by the KDWM in May 1995. The PRPs and the KDWM began negotiating an Agreed Order for performance of the remedy, and the PRPs asked the KDWM to notice other PRPs.
Spring/Summer 1997	The KDWM notified the PRPs that it had reviewed the additional information submitted and was declining to notice any additional PRPs. The PRPs and the KDWM met to discuss the terms of the Agreed Order; the KDWM informed the PRPs that additional work needed to be incorporated into the SOW.
October 8, 1997; March 30, 1998	Revised SOW was submitted to the KDWM.
May 1, 1998	The PRPs submitted the final SOW.
May 5, 1998	The KDWM approved the Final SOW submitted by the PRPs.
Summer 1998 – Summer 1999	Negotiations continued between the KDWM and the PRPs, and amongst the PRPs themselves, including Red Penn Sanitation and its shareholders.
August 13, 1999	An Agreed Order between the KDWM and seven PRPs was issued.
May 1999	RMT, Inc., conducted a predesign field study, which included the installation of three leachate head wells.
October 11, 1999	RMT, Inc., submitted the Final Remedial Design for the Red-Penn Landfill for Waste Management, Inc., and Ford Motor Company.
October 29, 1999	The KDWM approved the Remedial Design report.

**History of Operational and Regulatory Activities (continued)**  
**Red Penn Landfill - Pewee Valley, Kentucky**

DATE	ACTIVITY
May to October 2000	A multi-layer landfill cover was constructed over the Red Penn Landfill.
September 2000	The USEPA issued a Record of Decision, which stated that, based on the results of the RI, including the Risk Assessment, no CERCLA-funded remedial action was necessary to ensure that human health and the environment were protected.
December 2000	RMT, Inc., submitted the Construction Documentation Report for the Red Penn Landfill.
January 2001 to October 2005	Operation, monitoring, and maintenance activities were performed.
March 26, 2001	The KDWM approved the Construction Documentation Report.
September 14, 2001	USEPA deleted Red Penn from the NPL listing.
April 10, 2002	RMT, Inc., submitted the Year 2001 Annual OM&M Report.
July 23, 2002	The KDWM reviewed the Year 2001 Annual OM&M Report.
February 24, 2003	Waste Management filed a Deed Restriction for the Red Penn property with Oldham County.
March 13, 2003	RMT, Inc., submitted the Year 2002 Annual OM&M Report.
March 13, 2003	A request to eliminate MW8002-8975 and MW8002-8979 from the monitoring program was sent by RMT, Inc., on behalf of the PRPs, to the KDWM.
April 2, 2003	The KDWM approved a reduction in the sampling frequency for MW8002-8975 and MW8002-8979 from quarterly to annually instead of eliminating these wells from the sampling program.
December 19, 2003	RMT, Inc., submitted the Year 2003 Annual OM&M Report.
February 11, 2004	The KDWM reviewed the Year 2003 Annual OM&M Report.
January 17, 2005	RMT, Inc., submitted the Year 2004 Annual OM&M Report.
December 5, 2005	RMT, Inc., submitted the Year 2005 Annual OM&M Report.
February 1, 2006	Waste Management submitted the Agreed Order 5-Year Review Report that was prepared by RMT, Inc.
February 26, 2007	The KDWM requested that additional items be addressed in the Agreed Order 5-Year Review Report prior to approval. The additional items included the Biological Study, sampling of the Deep Aquifer, registration of an Environmental Covenant at the Oldham County Courthouse, and completion of the 5-year final landfill inspection.
April 19, 2007	The PRPs performed the additional sampling of the Deep Aquifer, as requested by the KDWM in its February 26, 2007, letter.
Fall 2007	The PRPs finalized the Environmental Covenant between the KDWM and the PRPs, as requested by the KDWM in its February 26, 2007, letter.
April 23, 2008	The PRPs performed the 5-year final landfill inspection with KDWM, as requested by the KDWM in its February 26, 2007, letter.

**History of Operational and Regulatory Activities (continued)**  
**Red Penn Landfill - Pewee Valley, Kentucky**

DATE	ACTIVITY
May 2008	The PRPs submitted a revised Agreed Order 5-Year Review Report, which included the additional information requested by the KDWM in its February 26, 2007, letter.
June 30, 2008	The PRPs recorded the signed Environmental Covenant in the office of the Clerk of the Oldham County Court.
November 6, 2008	KDWM submitted a letter to the PRPs concluding that the first 5-year review is complete, however due to the continued presence of waste at the site, additional 5 year reviews will be necessary.
February 4, 2009	The PRPs submitted a letter to the KDWM reiterating the items that will be required for compliance going forward.
February 26, 2009	The PRPs submitted a revised Operation, Maintenance, and Monitoring Plan to the KDWM.
March 3, 2009	KDWM approved the Operation, Maintenance, and Monitoring Plan on the condition that two minor additions to the text be made.
March 10, 2009	The PRPs submitted a Final Revised Operation, Maintenance, and Monitoring Plan to the KDWM that included the minor additions requested by KDWM.
April 22, 2009	The PRPs submitted a Workplan for the abandonment of the leachate head wells to the KDWM.
July 15, 2009	KDWM approved the Workplan for the abandonment of the leachate head wells via an e-mail.
August 2009	The PRPs had American Drilling Services of Indianapolis, IN, abandon the leachate head wells.
September 17, 2009	RMT, Inc. submitted documentation of the abandonment of the leachate head wells to Waste Management, Inc.
September 2010	The PRPs performed the second 5-year review landfill inspection with KDWM and performed a round of surface water and groundwater monitoring.
December 2010	The PRPs submitted a Second Agreed Order 5-Year Review Report.
September 2011	MW-8002-8975 and MW-8002-8979 were abandoned after KDWM approval of the request submitted by the PRPs as part of the Second Agreed Order 5 Year Review Report.
October 14, 2011	MW-8002-8975 and MW-8002-8979 were abandoned and documentation sent to KDWM.
September 2015	The PRPs performed the third 5 year review landfill inspection with KDWM and performed a round of surface water and groundwater monitoring.
December 2015	The PRPs submitted a Third Agreed Order 5-Year Review Report.

## Section 3

# Site Background

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### 3.1 Physical Characteristics

The site is located approximately 1.5 miles southeast of Pewee Valley, Kentucky, at the southern tip of Oldham County (refer to Figure 1). Shelby County lies to the east and southeast of the site, and Jefferson County lies to the south and southwest. The property is bounded to the east and southeast by Floyd's Fork Creek, to the southwest by Kentucky State Highway 362 (Ash Avenue) and an unnamed tributary of Floyd's Fork Creek, and to the northwest by Hawley Gibson Road. Floyd's Fork Creek is a perennial southwesterly flowing fork of the Salt River. The Salt River is located approximately 12 miles south of the site and flows westward into the Ohio River.

The landfill is located on approximately 151 acres of property owned by Red Penn Sanitation Company. Waste was disposed on approximately 48 of the 151 acres. The remaining 103 acres were used as a borrow area for landfill cover soil or were left as a wooded buffer area. After the installation of the upgraded cover, the elevation of the crest of the landfill was approximately 710 feet above mean sea level (M.S.L.) and approximately 100 feet above Floyd's Fork Creek. Before the construction of the upgraded cover, surface water drained radially off of the landfill. Diversion berms were installed as part of the upgraded cover to divert a portion of the surface water runoff to a riprap spillway and the perimeter ditch along the eastern side of the site (refer to Figure 2).

### 3.2 Local Land and Resource Use

Current land use around the site is primarily agricultural and residential. Agricultural activities include crop, pasture, and livestock operations. The Kentucky Correctional Institute for Women is located approximately 1,000 feet southeast of the site. Residential areas are located to the north, south, and west of the site. A residential subdivision was constructed to the north of the site, and municipal water was extended to this subdivision.

Commercial and industrial activity is limited near the site. The Ash Avenue Wastewater Treatment Facility is located to the northwest.

### 3.3 History of Impacts

The Red Penn Landfill began receiving waste in the 1940s, obtained a solid waste permit in 1959, and operated until 1986, when the KDWM closed the facility. A few months after the landfill ceased operation, drums of hazardous waste were discovered at both the entrance to the landfill and buried in a borrow area adjacent to the landfill. The KDWM conducted a Preliminary Assessment and a Site Investigation of the site in 1986. On the basis of the results of the Preliminary Assessment and Site Investigation, which indicated high concentrations of metals and organics in the samples collected from the drum excavation area, the KDWM filed a Request for Appropriate Action for immediate removal of the industrial waste discovered on-site. The impacted soil and drums were removed from the site entrance and the drum excavation area in September and October 1986.

In August 1987, the KDWM scored the Red Penn site using the Hazard Ranking System; a score of 38.1 was given. The site was placed on the USEPA's National Priority List in March 1989. On September 11, 1990, the USEPA issued a work assignment to CDM Federal Programs Corporation (CDM) to conduct a Remedial Investigation (RI) (CDM, 1993) at the Red Penn site. On the basis of the results of the RI, including the risk assessment, the USEPA determined that a CERCLA-funded remedial action was not justified for the site. However, because the landfill had not been properly closed by the Red Penn Sanitation Company, KDWM noticed the PRPs in order to have them conduct a corrective action at the site. In August 1999, the Commonwealth of Kentucky and several of the PRPs entered into an Agreed Order (KDWM, 1999) that required the PRPs to remediate the site in accordance with the KDWM-approved Scope of Work dated May 1, 1998.

Waste Management and Ford, two of the seven PRPs, retained RMT to perform predesign studies and to prepare a Remedial Design in accordance with the Scope of Work dated May 1, 1998, and the Agreed Order dated August 13, 1999. On October 29, 1999, the KDWM approved the Remedial Design report. The PRPs completed the construction of the approved remedy on October 10, 2000.

On September 19, 2000, the USEPA issued a Record of Decision (ROD), which stated that, based on the results of the RI, including the Risk Assessment, no CERCLA-funded remedial action was required to ensure that human health and the environment would be protected.

### 3.4 Basis for Taking Action

The hydrogeologic investigation that was part of the RI (CDM, 1993) included a geophysical evaluation, fracture trace studies, dye tracing studies, and private well surveys. Groundwater flow in the surficial aquifer was believed to be wholly intercepted by Floyd's Fork Creek and the unnamed tributary west of the site. The dye tracing investigation provided no evidence that

groundwater was migrating off-site, except via discharge into Floyd's Fork Creek and the tributary west of the site.

Other fieldwork conducted as part of the RI included a topographic survey; soil gas screening; surficial soil, surface water, sediment, groundwater, and leachate sampling; and an ecological investigation. Soil sample locations were chosen to coincide with the highest soil gas anomalies determined during the soil gas screening. Surface water and sediment samples were collected from Floyd's Fork Creek and the unnamed tributary to the west of the site, and from surface flows traversing the landfill. Leachate seeps were sampled and analyzed. Low concentrations of metals and various organic compounds, including pesticides and PCBs, were detected in most of the sampled media.

The leachate seeps contained the highest levels of residuals at the site. Of the 10 compounds indicated as constituents of concern (COCs), six were detected in the leachate (benzene; cadmium; chromium; and the pesticides alpha-BHC, beta-BHC, and gamma-BHC). Cyanide was detected at low levels in the surface soil and surface water samples, and lead was detected at low levels in several of the soil samples. Low levels of carbon disulfide and concentrations of iron and manganese that exceeded Federal Secondary Drinking Water Standards were detected in the two on-site monitoring wells (Secondary Standards are not health-based criteria and pertain to aesthetic qualities, such as odor, taste, and color). Bis(2-ethylhexyl)phthalate, a common laboratory contaminant, was detected at a low concentration in one of the monitoring wells.

As reported by CDM, the results of the ecological risk assessment indicated that the most significant adverse ecological impact was related to the leachate seeps, which apparently limited plant growth, and killed test aquatic microorganisms upon direct contact. However, the findings noted that leachate outbreaks were localized and the flow was restricted to the site. The study of flora and fauna during the RI concluded that there were no endangered species or habitats in the area. Furthermore, the RI indicated that chemicals that may potentially bioaccumulate in the food chain were randomly encountered in samples analyzed during the ecological investigation. In light of the concentrations detected and the area potentially affected, CDM determined that these chemicals were not likely to bioaccumulate in the food chain to the extent that a threat would be posed to human health and the environment. Therefore, the RI concluded that no major ecological risks were associated with the landfill.

The RI risk assessment considered the analytical results from the sampled media and evaluated potentially completed exposure scenarios and migration pathways. The noncancer risk associated with ingestion of soil, inhalation of dusts, dermal contact with soil, ingestion and dermal contact with leachate, ingestion of groundwater, and inhalation of volatile organic compounds released from groundwater was shown to be within acceptable regulatory

standards. The USEPA's acceptable risk level for noncancer risk is a Hazard Index (HI) of less than 1.0. The summed HI for a child and an adult was calculated to be 0.98. In addition, by summing the risks for a child and an adult across all pathways, the total site cancer risk was calculated to be 1.3 in 100,000. This level of risk was within the EPA's acceptable range of 1 in 10,000 to 1 in 1,000,000. Therefore, no COCs were identified for the site and the USEPA issued a no further action ROD on September 19, 2000.

## Section 4

# Remedial Actions

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### 4.1 Remedy Selection

#### 4.1.1 Objectives

On the basis of the findings of the Remedial Investigation, including the risk assessment (CDM, 1993), the SOW identified the following objectives in protecting human health and the environment:

- To prevent exposure to waste materials
- To install access controls
- To monitor for the effectiveness of the remedial actions

In addition, the SOW required that the remedial design be developed to address the following criteria:

- Protection of human health and the environment by preventing direct contact with the buried waste
- Installation of access controls
- Minimization of leachate generation from precipitation
- Prevention of surface water from coming in direct contact with the waste
- Stability of the cover for both the short and the long term

#### 4.1.2 Selected Remedy

The Final Remedial Design (RMT, 1999) describes the components of the selected remedy, which included the following major components:

- **Access controls** - Site security improvements will be implemented to control access, preclude inadvertent exposure to landfill materials, and prevent vandalism at the site.
- **Landfill cover** - A multi-layer landfill cover will be installed to be compliant with the SOW. Routine maintenance of the cover will be performed in accordance with the approved OM&M Plan.
- **Leachate head monitoring** - The leachate head levels at three monitoring points will be measured and recorded. After 5 years, trend analyses will be prepared and

evaluated, along with groundwater quality data, to determine if further monitoring or leachate management is necessary.

- **Groundwater and surface water monitoring** - The groundwater and surface water monitoring program will be implemented to assess the effectiveness of the remedial action. After 5 years, trend analyses will be prepared and evaluated to determine if further monitoring or leachate management is necessary.

## **4.2 Remedy Implementation**

Waste Management and Ford initiated the RA activities on May 5, 2000, in accordance with the requirements of the SOW and the Agreed Order between the Commonwealth of Kentucky and the PRPs. The construction of the upgraded landfill cover was completed in conformance with the Final Remedial Design (RMT, 1999). Documentation of the construction is contained in the Construction Documentation Report (RMT, 2000). The construction was approved by the KDWM on March 26, 2001 (refer to Appendix B). In January 2001, operation, monitoring, and maintenance activities commenced. A list of the contractors performing operation and maintenance at the site is provided in Table 1.

The following subsections describe the implementation of the remedy in more detail.

### **4.2.1 Access Controls**

The site is located in a rural setting, and unauthorized entrance via a paved road is restricted by a locked entrance gate on Ash Avenue. Several natural topographic features restrict access to the site as follows:

- Floyd's Fork Creek on the southern and eastern sides of the landfill
- The dense vegetation and the distance from Hawley Gibson Road on the western and northwestern sides of the landfill
- The extreme relief and the dense vegetation adjacent to the entrance gate on the western and southwestern sides of the landfill (Ash Avenue)

On August 31, 1999, the Agreed Order was recorded against the deed for the property containing the Red Penn Landfill by counsel for the Red Penn Sanitation Company. Waste Management filed a deed restriction with Oldham County on the property containing the Red Penn Landfill, in order to fulfill the requirements of the Agreed Order. The deed restriction filed by Waste Management is included in Appendix C.

In addition, during the fall of 2007, Red-Penn Sanitation Company, Inc.; Waste Management of Kentucky, L.L.C.; Ford Motor Company; and John G. Guelde finalized the Environmental Covenant (EC) for the property containing the Red Penn Landfill in order to fulfill the requirements stated in the February 26, 2007, letter from the KDWM

to Waste Management, regarding the 5-Year Review Report for the Red Penn Landfill. The signed EC is included in Appendix C.

#### **4.2.2 Upgraded Cover**

The upgraded cover was constructed to be compliant with the SOW and the approved Final Remedial Design. The upgraded cover consists of a 3- to 4-inch-thick general fill grading layer, a Bentomat® geosynthetic clay liner (GCL), a geocomposite layer, and a minimum 18-inch-thick vegetative layer. The final waste grades were adjusted from the grades in the Remedial Design, which were based on a 1996 aerial photograph, to account for differential settlement that had taken place since the time of the aerial photograph. The intent of the Remedial Design grading plan was to establish a minimum slope of approximately 2 percent and a maximum slope of approximately 25 percent. In addition to the upgraded cover, surface water controls, including diversion berms, and a riprap spillway and riprap check dams, were installed.

Since the cover was constructed, Waste Management, Ford, RMT, and TRC Environmental Corporation (TRC) have performed regular site inspections, including inspecting for evidence of stressed or sparse vegetation, erosion, settlement, and burrowing animals. When a problem has been identified, repairs to the cover have been made as soon as practicable. Documentation of the site inspections, and of the repair or maintenance activities performed, has been submitted to the KDWM in the annual OM&M reports (Refer to Appendix A).

#### **4.2.3 Leachate Monitoring Program**

Leachate head monitoring commenced following the installation of the leachate head wells in May 1999. The leachate head levels in LH-1, LH-2, and LH-3 (refer to Figure 2 for the former location of the leachate head wells) were measured in accordance with the OM&M Plan (Appendix G of the Final Remedial Design) (RMT, 1999) and the Post-Construction Performance Standards Verification Plan (PSVP) (Section 3 of the Final Remedial Design). The leachate head elevations were reported to the KDWM as part of the annual OM&M reports (refer to Appendix A).

The PRPs abandoned the leachate head wells in August 2009, after receiving approval from the KDWM that monitoring the leachate head wells was no longer required and the wells could be abandoned.

#### **4.2.4 Groundwater and Surface Water Monitoring Program**

Groundwater and surface water monitoring commenced upon completion of the construction of the upgraded final cover. Groundwater was sampled at three

monitoring wells and five springs in accordance with the requirements of the OM&M Plan (Appendix G of the Final Remedial Design) (RMT, 1999) and the PSVP (Section 3 of the Final Remedial Design). The locations of the groundwater monitoring wells and the springs are shown on Figure 2. The water samples were analyzed for the parameters listed in Table 2. The results of the groundwater analyses were reported to the KDWM as part of the annual OM&M reports (refer to Appendix A).

In addition to the groundwater and surface water sampling performed as part of the OM&M Plan and the PSVP, the PRPs performed the additional sampling of the two Deep Aquifer wells, per the KDWM letter dated February 26, 2007 (refer to Appendix A).

In accordance with the Revised OM&M Plan dated March 2009, groundwater and surface water monitoring is required once every 5 years as part of the 5-Year Review. A round of groundwater and surface water samples was collected and analyzed for the parameters listed in Table 2 in September 2010 during the second 5-year sampling event. During the 2010 sampling event, only two locations (MW-6 and Spring #1) had sufficient water to collect a sample for laboratory analysis.

The PRPs proposed to abandon monitoring wells MW-8002-8975 and MW-8002-8979 in the Second 5-Year Review Report, since the wells were dry and samples had not been collected at the wells for 10 out of 13 events and 11 out of 13 events, respectively. In September 2011 after KDWM approval was received, MW-8002-8975 and MW-8002-8979 were abandoned. The letter documenting approval to abandon the wells is included in Appendix B.

An additional round of surface water and groundwater samples was collected and analyzed for the parameters listed in Table 2 in September 2015 during the third 5-year sampling event. During this event, only two locations (MW-6 and Spring #1) had sufficient water to collect a sample for laboratory analysis.

#### **4.2.5 Drum Removal Activities**

An area of buried drums was encountered during the construction of the upgraded cover in 2000. The drums were discovered when general fill for the upgraded cover was excavated from the western end of the borrow area, northwest of the landfill. Forty-two crushed or partially crushed drums, as well as the visually impacted soil surrounding the drums, were removed and disposed off-site at Von Roll America, Inc., located in East Liverpool, Ohio.

## Section 5

# 5-Year Review Process

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### 5.1 Review Team

This 5-Year Review report was prepared by TRC, on behalf of Waste Management and Ford, based on the site inspections performed since the second 5-Year Review and the surface water and groundwater monitoring data collected by TRC in September 2015.

### 5.2 Review Methodology

This 5-Year Review report includes a review of the construction report, the annual OM&M reports, the site inspections performed since the second 5-Year Review, and the surface water and groundwater monitoring data collected by TRC in September 2015.

### 5.3 Community Notification and Involvement

This 5-Year Review report has been prepared for submission to the KDWM.

### 5.4 Document Review

This 5-Year Review report includes a review of the project documents listed in Appendix D of this report.

### 5.5 Data Review

This 5-Year Review report includes a review of the requirements of the Agreed Order, the monitoring data that were included in the annual OM&M reports and the monitoring data that has been collected since the last 5-Year Review. A summary of the design basis for the site was presented in Subsection 4.1.1, and a summary of the monitoring program for the site is presented in Table 2. Surface water and groundwater monitoring data is included in Appendix E and time trends are provided on Figures 3 through 9. Although the leachate head wells were abandoned in August 2009, the leachate head data from May 1999 through August 2005 is included on Figure 10.

#### 5.5.1 Access Control

On February 24, 2003, Waste Management filed a declaration of restrictions with Oldham County to inform the current and potential future property owners of the land use restrictions placed on the Red Penn Landfill property in accordance with the Agreed Order.

During the fall of 2007, Red-Penn Sanitation Company, Inc.; Waste Management; Ford; and John G. Guelda finalized the EC for the property containing the Red Penn Landfill in order to fulfill the requirements stated in the February 26, 2007, letter from the KDWM to Waste Management, regarding the 5-Year Review Report for the Red Penn Landfill. On June 30, 2008, the EC was recorded in the office of the clerk of the Oldham County Court. The signed EC is included in Appendix C.

The findings of the site inspections performed during this 5-year review period indicate that the security measures in place are adequate. The entrance gate was replaced in 2010 and has remained locked. No vandalism has occurred at the site.

#### **5.5.2 Landfill Cover**

The findings of the site inspections performed during this 5-year review period indicate no situations in which waste has been exposed as a result of damage to the landfill cover due to erosion or burrowing animals. The cover vegetation appears to be healthy and no areas requiring maintenance were observed during the site inspections. Landfill cover settlement has been minor and uniform; thus, ponding of surface water has not been an issue.

During the September 2015 site inspection, no areas on the upgraded cover required repair.

In 2004, Waste Management and Ford retained the services of Simply Natural Landscaping Consulting of Louisville, Kentucky, to plant native plant species in areas outside of the limits of the upgraded cover to minimize future erosion of areas off of the cover, and to provide additional wildlife habitat. The plantings consisted of native grasses and 14 kinds of bushes and trees. Over 200 bushes and trees were planted.

Although it appears the majority of the bushes and trees did not survive, no areas off the final cover required maintenance based on the September 2015 site inspection.

#### **5.5.3 Leachate Monitoring**

After receiving approval from the KDWM, the PRPs abandoned the leachate head wells in August 2009. A letter documenting the abandonment of the leachate head wells was submitted by RMT to Waste Management on September 17, 2009 and is included in Appendix B.

Although the leachate head wells were abandoned, the leachate head data from May 1999 through August 2005 is included in Table 3 and on Figure 10. The leachate level at

LH-1 decreased since the beginning of monitoring in May 1999, for a total decrease of approximately 24 feet. The last observed leachate level at LH-1 was approximately 3 feet above what is believed to be the base of the landfill. The leachate level at LH-2 decreased approximately 13 feet from the initial reading. The last observed leachate level at LH-2 was approximately 33 feet above what is believed to be the base of the landfill. The leachate level at LH-3 began decreasing shortly after the construction of the cover and has stabilized at or near (within a few feet) what is believed to be the base of the landfill.

#### **5.5.4 Surface Water and Groundwater Monitoring**

The surface water and groundwater analytical results from the first and second 5-year review period, the additional Deep Aquifer groundwater data requested in the February 26, 2007, KDWM letter, and the surface water and groundwater analytical results from the third 5-year review period are contained in Appendix E. Table 4 summarizes the number of times each parameter was detected since the upgraded cover was installed in 2000 and the minimum and maximum concentrations detected. As detailed in the PSVP, the data from the groundwater and surface water monitoring activities were used to prepare time trends (Figures 3 through 9) to determine if further groundwater and/or surface water monitoring, or leachate management is necessary.

#### **5.5.5 Site Inspections**

The findings of the site inspection performed during this 5-year review period indicated no situations in which waste has been exposed as a result of damage to the upgraded cover due to erosion or burrowing animals. Repairs and maintenance to the cover have included repairing erosion and tire ruts, and seeding and fertilizing the landfill cover. In addition, riprap was installed in areas off the upgraded cover to help stabilize the slopes and reduce erosion. The site inspection information for 2011 through 2015 is included in Appendix F.

### **5.6 Site Interviews**

A site interview was conducted by Waste Management with KDWM staff on September 16, 2015 during a site visit, as a part of this report preparation.

## Section 6

# Findings and Conclusions

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The remedy that was implemented at the Red Penn Landfill continues to be protective of human health and the environment after 5 years of OM&M, per the OM&M Plan and the PSVP, and the additional 10 years of monitoring and inspections performed through 2015. This is based on the implementation and performance of the site remedy described in Sections 4 and 5, and the monitoring results contained in Tables 3 through 5, and Appendix E.

In accordance with the Agreed Order and the PSVP, the leachate head monitoring results were evaluated following the Agreed Order 5-year period and it was determined in 2009 that continued monitoring was not necessary and the leachate head wells were abandoned. Analysis of the time trends for leachate head (Figure 10) indicated that the installation of the upgraded final cover had reduced the overall leachate head within the landfill. Specifically, the leachate head elevations at LH-1 and LH-3 decreased since the installation of the upgraded cover, to the point where the elevations were within approximately 3 feet of the base of the landfill. The leachate head elevation at LH-2 also trended downward during the first 2 years following the installation of the upgraded cover. The leachate head reduction at LH-2 fluctuated between 11 to 18 feet below the ground surface during the period from 2003 through 2005. The results of the leachate head measurements indicated that the infiltration of precipitation through the cover has been minimized, and that the leachate head was reduced as a result. This reduction in the leachate head reduced the driving force and reduced the potential for leachate to migrate into the environment.

In accordance with the Agreed Order and the PSVP, the groundwater and surface water monitoring results were evaluated after the first 5-years of monitoring to determine if additional monitoring or leachate management was necessary. In March 2009, a revised OM&M Plan was approved by KDWM, which requires groundwater and surface water monitoring only once every 5 years. During the second 5-year sampling event, only two locations (MW-6 and Spring #1) had sufficient water to collect a sample for laboratory analysis. The results of the second 5-year review samples were non-detect for all parameters, with the exception of barium and nickel at MW-6, and barium at Spring #1.

The PRPs proposed to abandon monitoring wells MW-8002-8975 and MW-8002-8979 in the Second 5-Year Review Report since the wells were dry and samples had not been collected at the wells for 10 out of 13 events and 11 out of 13 events, respectively. In September 2011 after KDWM approval was received, MW-8002-8975 and MW-8002-8979 were abandoned.

The third 5-year sampling event occurred in September 2015. Similarly to the 2010 sampling event, during the third 5-year sampling event, only two locations (MW-6 and Spring #1) had sufficient water to collect a sample for laboratory analysis. The results of the third 5-year review samples were non-detect for all parameters, with the exception of barium, chromium, and nickel at MW-6, and barium at Spring #1. The analytical results for barium and chromium were within the historical range indicated in Table 4. The analytical result for nickel at MW-6 was slightly above the historical range indicated in Table 4; however, nickel was not identified as a COC during the RI.

During the last 15 years of surface water and groundwater monitoring, only one parameter (lead) that was identified as a potential constituent of concern in the RI, exceeded the maximum concentrations detected at the time of the RI and used in the Risk Assessment. The highest concentration of lead detected during the RI was 9 µg/L. During the first monitoring event following the construction of the upgraded cover, lead was detected above this concentration at MW-8002-8979, Spring #3, and Spring #4 at concentrations of 22, 13, and 11 µg/L, respectively. Lead has not been detected above the Estimated Quantitation Limit (EQL) since 2001, including the samples collected in April 2007, September 2010, and September 2015.

Therefore, the conclusions of the RI, including the Biological Study, and the Risk Assessment, which stated that the noncancer risks and cancer risks associated with the landfill were within the USEPA's acceptable target range, are still applicable (refer to Subsection 3.4 of this report regarding the findings of the USEPA). Furthermore, as previously identified by the USEPA there are no impacts from leachate to Floyds Fork Creek nor are there any to the surrounding vegetation. This was verified as part of the 5-year review inspection on September 16, 2015.

Groundwater and surface water monitoring at the site over the past 15 years has demonstrated that concentrations of COCs (cadmium, chromium, lead, benzene, cyanide, BHC, Bis (2-ethylhexyl)phthalate and carbon disulfide) are generally steady or decreasing and are well below the concentrations detected during the RI. As discussed during the site inspection in September 2015, the PRPs are proposing that MW-6 be abandoned and that in addition to MW-6, the five springs no longer be part of the monitoring program. Going forward, the PRPs propose that the only activity conducted at the site is a Five-Year Inspection Report to document site conditions and compliance with the Agreed Order.

## Section 7

# Agreed Order Termination Requirements

The Agreed Order (KDWM, 1999) states that the Agreed Order shall terminate upon the Settling Parties' completion of all requirements described therein. The following table contains the requirements of the Agreed Order and documents the completion of these items.

### Agreed Order Termination Requirements Red Penn Landfill - Pewee Valley, Kentucky

REQUIREMENTS OF THE AGREED ORDER	
ACTION REQUIRED	ACTION TAKEN
Develop a Remedial Design (RD) in accordance with the provisions of all applicable state requirements and as outlined in the Scope of Work (SOW).	<b>Completed</b> as the Remedial Design was prepared in accordance with the SOW dated May 1, 1998. The Final Remedial Design was submitted on October 11, 1999, and approved by the KDWM on October 29, 1999.
Prepare and submit a prefinal design for approval by the KDWM.	<b>Completed</b> as the prefinal design was submitted in July 1999; and the KDWM provided comments on August 10, 1999.
Within 45 days of approval of the prefinal design, prepare and submit a final design for approval by the KDWM.	<b>Completed</b> as the Final Remedial Design was submitted on October 11, 1999, and was approved by the KDWM on October 29, 1999.
Within 45 days of approval of the RD, prepare and submit a Remedial Action Workplan (RAW) for approval by the KDWM.	<b>Completed</b> as the RAW was submitted on December 10, 1999; and the KDWM provided comments on December 27, 1999.
Implement the RAW.	<b>Completed</b> as Remedial Action construction began on May 5, 2000, and was completed on October 10, 2000.
Within 60 days of completion, prepare and submit a final report documenting the work outlined in the RAW.	<b>Completed</b> as the Construction Documentation Report was submitted on December 22, 2000, and was approved by the KDWM on March 26, 2001.
Perform operation and maintenance work as outlined in the Operations and Maintenance Plan included in the RD.	<b>Completed</b> as the operation and maintenance work was conducted in accordance with the Operations, Maintenance, and Monitoring Plan included in Appendix G of the Final Remedial Design. Annual OM&M Reports documenting the operations and maintenance work were submitted to the KDWM on April 10, 2002; March 13, 2003; December 13, 2003; January 17, 2005; and December 5, 2005.

**Agreed Order Termination Requirements (continued)**  
**Red Penn Landfill - Pewee Valley, Kentucky**

<b>REQUIREMENTS OF THE AGREED ORDER</b>	
<b>ACTION REQUIRED</b>	<b>ACTION TAKEN</b>
Provide access to the site to the KDWM.	<b>Completed</b> as the Owner Settling Party, upon signature of the Agreed Order (per paragraph 27 of the Agreed Order), provided the KDWM access to the site.
Record an executed copy of the Agreed Order with the Oldham County Clerk, La Grange, Kentucky.	<b>Completed</b> as the attorney for the Owner Settling Party, Matthew Carey, recorded the Agreed Order with Oldham County on August 31, 1999 (Book D622, page 223-52).
<b>REQUIREMENTS OF THE SCOPE OF WORK</b>	
<b>ACTION REQUIRED</b>	<b>ACTION TAKEN</b>
Prepare the remedial design and the leachate evaluation study, addressing the following issues: <ul style="list-style-type: none"> <li>▪ Access controls</li> <li>▪ Landfill cover design</li> <li>▪ Leachate evaluation study</li> <li>▪ Groundwater monitoring</li> </ul>	<b>Completed</b> as these items were included in the approved Final Remedial Design submitted to the KDWM on October 11, 1999, and approved on October 29, 1999.
Prepare the RD addressing, at a minimum, the following items: <ul style="list-style-type: none"> <li>▪ Landfill cover configuration</li> <li>▪ Erosion control and surface water flow</li> <li>▪ Existing leachate ponds and ponded surface water</li> <li>▪ Slope stability</li> <li>▪ Remedial costs</li> </ul>	<b>Completed</b> as these items were included in the approved Final Remedial Design submitted to the KDWM on October 11, 1999, and approved on October 29, 1999.
Design the landfill to meet the following minimum criteria: <ul style="list-style-type: none"> <li>▪ Protection of human health and the environment by preventing direct contact with buried waste</li> <li>▪ Minimization of leachate generation from precipitation</li> <li>▪ Minimization of final cover erosion</li> </ul>	<b>Completed</b> as these design criteria were included in the approved Final Remedial Design submitted to the KDWM on October 11, 1999, and approved on October 29, 1999.
Fill in the two existing leachate ponds on the southern side of the landfill to match existing site contours. Water in the ponds will be removed prior to filling in the ponds. Existing surface water ponds located on top of the landfill will be drained prior to installation of the landfill cover.	<b>Completed</b> as the two leachate ponds on the southern side of the landfill were filled to match the existing site contours and minimize standing water. At the time of construction, standing water was not encountered in the leachate ponds or in low areas within the limits of waste.

**Agreed Order Termination Requirements (continued)**  
**Red Penn Landfill - Pewee Valley, Kentucky**

<b>REQUIREMENTS OF THE SCOPE OF WORK</b>	
<b>ACTION REQUIRED</b>	<b>ACTION TAKEN</b>
A slope stability analysis will be performed for the following conditions: prior to landfill cover construction, during landfill cover construction, and after the landfill cover has been constructed.	<p><b>Completed</b> as part of the approved Final Remedial Design submitted to the KDWM on October 11, 1999, and approved on October 29, 1999, a global stability analysis was performed. This analysis included a discussion and the necessary calculations for the following conditions:</p> <ul style="list-style-type: none"> <li>▪ prior to landfill cover construction</li> <li>▪ during landfill cover construction</li> <li>▪ after landfill cover construction</li> </ul>
<p>In addition to drawings and specifications, submit the following supporting documents as part of the prefinal design:</p> <ul style="list-style-type: none"> <li>▪ Construction Quality Assurance Plan for construction of the landfill cover</li> <li>▪ Post-Construction Performance Standard Verification Plan, including methods and procedures for monitoring the effectiveness of the design components</li> </ul>	<p><b>Completed</b> as these items were included in the prefinal design document submitted to the KDWM in July 1999.</p>
<p>As part of the landfill Cover Design, conduct a leachate evaluation study. The purpose of the leachate study will be to determine the following:</p> <ul style="list-style-type: none"> <li>▪ Estimate the quantity of leachate by installing piezometers within the waste mass.</li> <li>▪ Determine the effect of the updated cover on minimizing the generation of leachate (to include using the HELP model).</li> <li>▪ Estimate a water balance for leachate at the site.</li> </ul> <p>Based on the above information, a leachate evaluation report will be written and submitted with the prefinal design documents. This report will discuss if engineering controls may be required, and if required, the types of controls and the potential timeframe for installing these controls.</p>	<p><b>Completed</b> as these items were included in the prefinal design documents submitted in July 1999, and the approved Final Remedial Design submitted to the KDWM on October 11, 1999, and approved on October 29, 1999.</p> <p>During the 5 years of operation and maintenance at the site, the leachate levels have decreased. In addition, no impacts from the leachate were observed during the site inspections that were conducted as part of the operation and maintenance activities.</p>
The Remedial Design will include a groundwater monitoring program as part of the Operation and Maintenance Plan to assess the effectiveness of remedial action.	<p><b>Completed</b> as the Operations, Maintenance, and Monitoring Plan was included as Appendix G of the approved Remedial Design.</p>

**Agreed Order Termination Requirements (continued)**  
**Red Penn Landfill - Pewee Valley, Kentucky**

REQUIREMENTS OF THE SCOPE OF WORK	
ACTION REQUIRED	ACTION TAKEN
<p>Upon completion of the remedial action, collect and analyze samples from the five springs and the three monitoring wells on a semiannual basis for 5 years. At the completion of 5 years, the data will be evaluated to determine if continued monitoring is necessary.</p> <p>Prepare a Groundwater Monitoring Plan, outlining the methods, procedures, and quality control measures to be used to implement the groundwater program. The Groundwater Monitoring Plan will include a Health and Safety Plan and a Field Sampling and Analysis Plan for the collection, sampling, field filtering, and analyses associated with groundwater monitoring. Sampling and analysis procedures for the water located in the leachate ponds and the ponded surface water on the landfill will also be included in the Groundwater Monitoring Plan. The Groundwater Monitoring Plan will be submitted to the KDWM as part of the Prefinal and Final Design.</p>	<p><b>Completed</b> as samples were collected and analyzed in accordance with the approved Post-Construction Performance Standards Verification Plan (Section 3 of the Final Remedial Design); the OM&amp;M Plan; and revisions to these plans as approved by the Kentucky Department of Environmental Protection, dated April 2, 2003.</p> <p>A Groundwater Monitoring Plan was included in the Final Remedial Design submitted and approved by the KDWM on October 11, 1999, and October 29, 1999, respectively.</p>

**Additional Requirements Requested by the KDWM**  
**Red Penn Landfill - Pewee Valley, Kentucky**

ADDITIONAL REQUIREMENTS REQUESTED	
ACTION REQUIRED	ACTION TAKEN
<p>Prior to the 5-Year Review Report being accepted, the following items need to be addressed, as stated in the February 26, 2007, letter from the KDWM:</p> <ul style="list-style-type: none"> <li>▪ The Biological Study must be addressed as in the original documents.</li> <li>▪ The Deep Aquifer must be sampled off-site as in the original documents.</li> <li>▪ An Environmental Covenant (EC) signed by the owner(s) of the property must be registered at the Oldham County Courthouse as per our Office of Legal Services.</li> <li>▪ The 5-Year Inspection and walk-over of the site by the interested parties must occur after the EC has been registered, and must include a representative of KDWM.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The Biological Study was addressed in the second 5-Year Review Report.</li> <li>▪ The Deep Aquifer was sampled on April 19, 2007; and the results are contained in this 5-Year Review Report (Appendix E).</li> <li>▪ A signed Environmental Covenant that was registered at the Oldham County Court on June 30, 2008, has been included in this document.</li> <li>▪ The First 5-Year final landfill inspection was conducted on April 23, 2008.</li> <li>▪ The Second 5-Year Review was completed and submitted to the KDWM in December 2010.</li> <li>▪ The Third 5-Year Review was completed and submitted to the KDWM in December 2015.</li> </ul>

**Additional Requirements Requested by the KDWM  
Red Penn Landfill - Pewee Valley, Kentucky**

<b>ADDITIONAL REQUIREMENTS REQUESTED</b>	
<b>ACTION REQUIRED</b>	<b>ACTION TAKEN</b>
<p>In a letter dated November 6, 2008, KDWM determined the following as part of the acceptance of the first 5-Year Review Report:</p> <ul style="list-style-type: none"> <li>▪ Yearly monitoring and site mowing may be discontinued.</li> <li>▪ The site access must continue to be controlled by means of a locked gate.</li> <li>▪ The property owner must provide annual certification in the form of a letter that the condition of the site has not changed. The letter will describe all changes made at the site, if any. The letter will be due on January 30 of each year.</li> <li>▪ The next 5-year review will be due on January 30, 2011. This will be the responsibility of the original PRPs listed in the Agreed Order. It will include a round of groundwater sampling (the three wells and five springs), a description of the condition of the landfill cover and site access controls, and a brief site walkover with personnel from KDWM Superfund Branch.</li> <li>▪ The OM&amp;M Plan needed to be updated to reflect these changes.</li> </ul>	<ul style="list-style-type: none"> <li>▪ The site access continues to be controlled by a locked gate. A new gate was installed in 2010.</li> <li>▪ The property owner has provided annual certification in the form of a letter to KDWM that indicates the condition of the site.</li> <li>▪ The PRPs completed the second 5-year review and submitted it to KDWM prior to January 30, 2011.</li> <li>▪ The PRPs revised the OM&amp;M Plan to reflect the changes at the site and submitted a final revised document to KDWM on March 10, 2009.</li> </ul>

Based on the conclusions stated above, the PRP Group has completed all the requirements of the Agreed Order and the additional requirements discussed in the February 26, 2007, and November 6, 2008, letters from KDWM to the PRPs. However, as stated in the November 6, 2008, letter, the KDWM has determined that due to the continued presence of waste at the site, additional 5-year reviews will be necessary and that the Agreed Order cannot be terminated. Assuming the requirement continues, the Fourth 5-Year Review will be due on January 30, 2021. As discussed in this 5-Year Review, the site is in compliance with all the requirements of the 1999 Agreed Order.

**Table 1**  
**List of Contractors Performing OM&M**  
**Red-Penn Landfill**  
**Peewee Valley, Kentucky**

CONTRACTOR	O&M DUTIES
RMT, Inc./TRC Environmental Corporation	General OM&M and reporting
EnChem Laboratories (2001) and Test America (formerly known as Severn Trent Laboratories) (2002 through 2015)	Environmental sample analyses
Simply Natural Landscape Consulting	Landscaping
Martin Landscaping, Inc.	Landscaping and mowing
American Drilling Services	Groundwater monitoring well abandonment

**Table 2**  
**Post-Construction Performance Standards Verification Plan**  
**Red-Penn Landfill**  
**Peewee Valley, Kentucky**

TASK	FREQUENCY	PARAMETERS
<b>I. Groundwater Monitoring<sup>(1)</sup></b>		
Collect samples at MW-6 and Springs #1 through #5 <sup>(2)</sup> .	Every 5 years <sup>(3)</sup>	Observe and compare concentrations of benzene; chlorobenzene; chloroethane; cis-1,2-dichloroethene; PCBs <sup>(4)</sup> ; cyanide (total); antimony; arsenic; barium; cadmium; chromium; lead; and nickel with previous monitoring results.
<b>II. Land Surface Care</b>		
Inspect final cover, site condition, and access points.	Every 5 years <sup>(3)</sup>	Note visual evidence of exposed waste, vandalism, etc.

**Footnotes:**

<sup>(1)</sup> The locations of the monitoring points are shown on Figure 2.

<sup>(2)</sup> The five springs at the site have been given identification numbers as follows:

- Spring #1 – Thibocillis Spring
- Spring #2 – Fairlane 500 Spring
- Spring #3 – Garbage Spring
- Spring #4 – Pond seep area
- Spring #5 – Bedding plane spring

<sup>(3)</sup> In accordance with the November 6, 2008, letter from KDWM and the revised Sampling and Analysis Plan.

<sup>(4)</sup> The following PCB Aroclors were analyzed: 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

**Table 3**  
**Leachate Head Measurements and Calculated Elevations at LH-1 through LH-3**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**

DATE	TOP OF PVC CASING (ft. M.S.L.)	DEPTH OF LEACHATE BELOW TOP OF PVC CASING (ft.)	LEACHATE ELEVATION (ft. M.S.L.)	BOTTOM OF PVC SCREEN (ft. M.S.L.) <sup>(1)</sup>	HEIGHT OF LEACHATE ABOVE BOTTOM OF PVC SCREEN (ft.)
<b>LEACHATE HEAD WELL LH-1</b>					
6-May-99	709.83	8.0	701.83	675.30	26.53
15-Sep-99	709.83	13.0	696.83	675.30	21.53
12-Aug-00	709.83	21.9	687.93	675.30	12.63
29-Aug-00	709.83	22.5	687.33	675.30	12.03
26-Sep-00	709.83	21.45	688.38	675.30	13.08
28-Feb-01	709.83	21.09	688.74	675.30	13.44
4-May-01	709.83	21.22	688.61	675.30	13.31
21-Aug-01	709.83	21.46	688.37	675.30	13.07
27-Nov-01	709.83	21.58	688.25	675.30	12.95
18-Feb-02	709.35	23.88	685.47	675.30	10.17
21-May-02	709.35	24.02	685.33	675.30	10.03
08-Aug-02	709.35	23.98	685.37	675.30	10.07
18-Nov-02	709.35	23.99	685.36	675.30	10.06
25-Mar-03	709.35	24.14	685.21	675.30	9.91
29-Oct-03	709.35	26.47	682.88	675.30	7.58
21-Apr-04	709.35	28.30	681.05	675.30	5.75
13-Oct-04	709.35	27.60	681.75	675.30	6.45
14-Apr-05	709.35	30.30	679.05	675.30	3.75
11-Oct-05	709.35	31.35	678.00	675.30	2.70

**Footnotes:**

- <sup>(1)</sup> Bottom of PVC screen is approximately 1 foot above the base of the landfill.
- <sup>(2)</sup> Leachate head well LH-3 was initially dry when the well was completed. The depth of leachate in LH-3 on May 6, 1999, was measured 24 hours after the completion of LH-3, in accordance with the Leachate Head Well Installation Workplan; however, the leachate level was still rising at the time of the measurement. Therefore, it is not believed that this was a representative leachate head level.
- <sup>(3)</sup> The actual depth of leachate below the top of the PVC casing was recorded as 27.00 ft and 27.10 ft. The leachate head well depth is 26.91 ft; thus, it is assumed that water was present at the bottom of the well in the end cap and the measurement contained a small amount of error.

**Table 3 (continued)**  
**Leachate Head Measurements and Calculated Elevations at LH-1 through LH-3**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**

DATE	TOP OF PVC CASING (ft. M.S.L.)	DEPTH OF LEACHATE BELOW TOP OF PVC CASING (ft.)	LEACHATE ELEVATION (ft. M.S.L.)	BOTTOM OF PVC SCREEN (ft. M.S.L.) <sup>(1)</sup>	HEIGHT OF LEACHATE ABOVE BOTTOM OF PVC SCREEN (ft.)
<b>LEACHATE HEAD WELL LH-2</b>					
6-May-99	687.72	6.0	681.72	636.27	45.45
15-Sep-99	687.72	14.0	673.72	636.27	37.45
12-Aug-00	687.72	10.2	677.52	636.27	41.25
29-Aug-00	687.72	11.0	676.72	636.27	40.45
26-Sep-00	687.72	10.2	677.52	636.27	41.25
28-Feb-01	687.72	17.44	670.28	636.27	34.01
4-May-01	687.72	20.87	666.85	636.27	30.58
21-Aug-01	687.72	20.61	667.11	636.27	30.84
27-Nov-01	687.72	20.43	667.29	636.27	31.02
18-Feb-02	687.72	21.57	666.15	636.27	29.88
21-May-02	687.72	21.71	666.01	636.27	29.74
08-Aug-02	687.39	22.52	664.87	636.27	28.60
18-Nov-02	687.39	23.98	663.41	636.27	27.14
25-Mar-03	687.39	22.9	664.49	636.27	28.22
29-Oct-03	687.39	22.65	664.74	636.27	28.47
21-Apr-04	687.39	22.60	664.79	636.27	28.52
13-Oct-04	687.39	22.00	665.39	636.27	29.12
14-Apr-05	687.39	22.62	664.77	636.27	28.50
11-Oct-05	686.97	17.90	669.07	636.27	32.80

**Footnotes:**

- (1) Bottom of PVC screen is approximately 1 foot above the base of the landfill.
- (2) Leachate head well LH-3 was initially dry when the well was completed. The depth of leachate in LH-3 on May 6, 1999, was measured 24 hours after the completion of LH-3, in accordance with the Leachate Head Well Installation Workplan; however, the leachate level was still rising at the time of the measurement. Therefore, it is not believed that this was a representative leachate head level.
- (3) The actual depth of leachate below the top of the PVC casing was recorded as 27.00 ft and 27.10 ft. The leachate head well depth is 26.91 ft; thus, it is assumed that water was present at the bottom of the well in the end cap and the measurement contained a small amount of error.

**Table 3 (continued)**  
**Leachate Head Measurements and Calculated Elevations at LH-1 through LH-3**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**

DATE	TOP OF PVC CASING (ft. M.S.L.)	DEPTH OF LEACHATE BELOW TOP OF PVC CASING (ft.)	LEACHATE ELEVATION (ft. M.S.L.)	BOTTOM OF PVC SCREEN (ft. M.S.L.) <sup>(1)</sup>	HEIGHT OF LEACHATE ABOVE BOTTOM OF PVC SCREEN (ft.)
<b>LEACHATE HEAD WELL LH-3</b>					
6-May-99	704.49	23.0 <sup>(2)</sup>	681.49	677.58	3.91 <sup>(2)</sup>
15-Sep-99	704.49	14.0	690.49	677.58	12.91
12-Aug-00	704.49	19.4	685.09	677.58	7.51
29-Aug-00	704.49	19.5	684.99	677.58	7.41
26-Sep-00	704.49	20.4	684.09	677.58	6.51
28-Feb-01	704.49	22.39	682.10	677.58	4.52
4-May-01	704.49	22.06	682.43	677.58	4.85
21-Aug-01	704.49	22.92	681.57	677.58	3.99
27-Nov-01	704.49	23.12	681.37	677.58	3.79
18-Feb-02	704.49	23.65	680.84	677.58	3.26
21-May-02	704.49	24.99	679.50	677.58	1.92
08-Aug-02	704.49	25.79	678.70	677.58	1.12
18-Nov-02	704.49	24.66	679.83	677.58	2.25
25-Mar-03	704.49	23.94	680.55	677.58	2.97
29-Oct-03	704.49	26.83	677.66	677.58	0.08
21-Apr-04	704.49	25.45	679.04	677.58	1.46
13-Oct-04	704.49	27.00 <sup>(3)</sup>	677.49	677.58	-0.09 <sup>(3)</sup>
14-Apr-05	704.49	24.39	680.10	677.58	2.52
11-Oct-05	704.49	27.10 <sup>(3)</sup>	677.39	677.58	-0.19 <sup>(3)</sup>

**Footnotes:**

- <sup>(1)</sup> Bottom of PVC screen is approximately 1 foot above the base of the landfill.
- <sup>(2)</sup> Leachate head well LH-3 was initially dry when the well was completed. The depth of leachate in LH-3 on May 6, 1999, was measured 24 hours after the completion of LH-3, in accordance with the Leachate Head Well Installation Workplan; however, the leachate level was still rising at the time of the measurement. Therefore, it is not believed that this was a representative leachate head level.
- <sup>(3)</sup> The actual depth of leachate below the top of the PVC casing was recorded as 27.00 ft and 27.10 ft. The leachate head well depth is 26.91 ft; thus, it is assumed that water was present at the bottom of the well in the end cap and the measurement contained a small amount of error.

**Table 4**  
**Summary of the OM&M Groundwater Monitoring Results**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**

CONSTITUENT	ESTIMATED QUANTITATION LIMIT (EQL) (µg/L)	FREQUENCY OF DETECTION ABOVE THE EQL	MINIMUM REPORTED CONCENTRATION (µg/L)	MAXIMUM DETECTED CONCENTRATION (µg/L)
Total cyanide	10	6/70	<10	110
Antimony	10	0/72	<10	<10
Arsenic	10	2/72	<10	11.7
Barium	5.0	72/72	24	530
Cadmium	1.0	5/70	<1	6.3
Chromium	3.0	14/72	<3	35
Lead	5.0	5/72	<5	22
Nickel	5.0	38/72	<5	85.2
Aroclor-1016	1.0	0/74	<1	<1
Aroclor-1221	1.0	0/74	<1	<1
Aroclor-1232	1.0	0/74	<1	<1
Aroclor-1242	1.0	0/74	<1	<1
Aroclor-1248	1.0	0/74	<1	<1
Aroclor-1254	1.0	0/74	<1	<1
Aroclor-1260	1.0	0/74	<1	<1
Benzene	1.0	4/75	<1	2.4
Chlorobenzene	1.0	0/75	<1	<1
Chloroethane	2.0	0/75	<2	<2
cis-1,2-Dichloroethene	1.0	0/75	<1	<1

**Table 5**  
**Comparison of the OM&M Groundwater Monitoring Results**  
**With the RI Results**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**

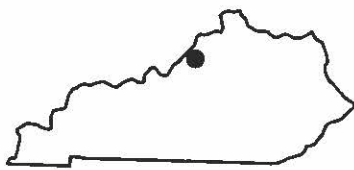
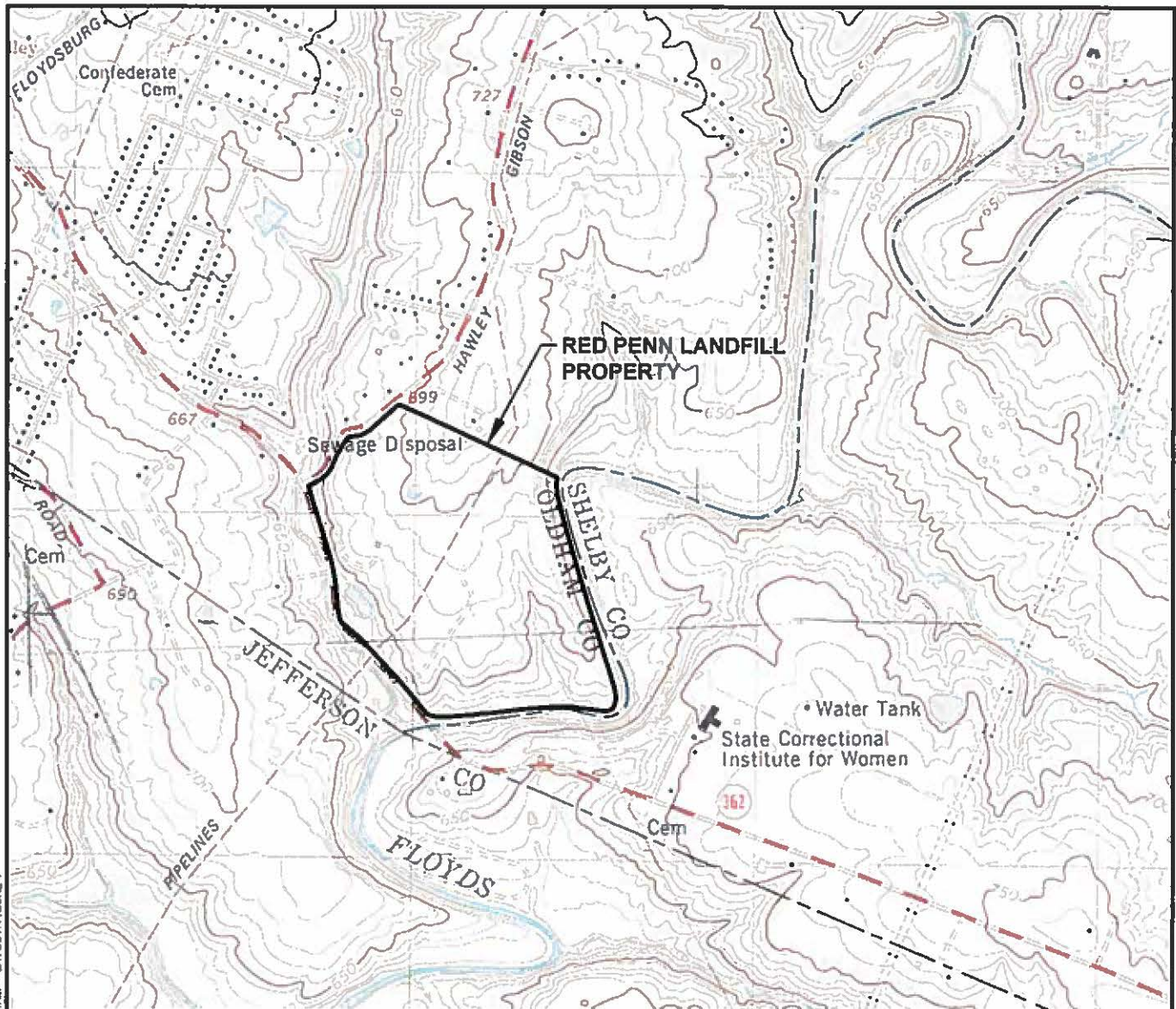
PARAMETER	MAXIMUM CONCENTRATION DETECTED DURING OM&M ACTIVITIES (µg/L)	RANGE OF CONCENTRATIONS DETECTED DURING THE REMEDIAL INVESTIGATION <sup>(2)</sup> (µg/L)
Arsenic	11.7	12-34
Barium	530	27-440
Cadmium <sup>(1)</sup>	6.3	3-13
Chromium <sup>(1)</sup>	35	18-65
Lead <sup>(1)</sup>	22	4-9
Nickel	85	17-81
Benzene <sup>(1)</sup>	2.4	3.5-6.5
Total cyanide <sup>(1)</sup>	110	31-350

**Footnotes:**

<sup>(1)</sup> Contaminants of concern (COCs) in the baseline risk assessment (CDM, 1993).

<sup>(2)</sup> Range of concentrations detected during the RI in the leachate, surface water, and groundwater. Results reported as below the EQL are not included.

AS11 - ATTACHED SHEETS - ATTACHED MAPS - 233972.0000.01.dwg - PLOT DATE: November 30, 2015 - 10:04AM - LAYOUT: FIGURE 1  
DRAWING NAME: J:\HW\Red Penn\2339720000.01.dwg



**SITE LOCATION**

SOURCE: BASE MAP DEVELOPED FROM CRESTWOOD,  
KENTUCKY 7.5 MIN. USGS QUADRANGLE.



NOT TO SCALE



PROJECT:

**WASTE MANAGEMENT, INC.  
RED PENN LANDFILL  
PEWEE VALLEY, KENTUCKY**

TITLE:

**SITE LOCATION MAP**

DRAWN BY:

**L. STORMER**

CHECKED BY:

**RW**

APPROVED BY:

**MJA**

DATE:

**DECEMBER 2015**

PROJ NO:

**233972.0000**

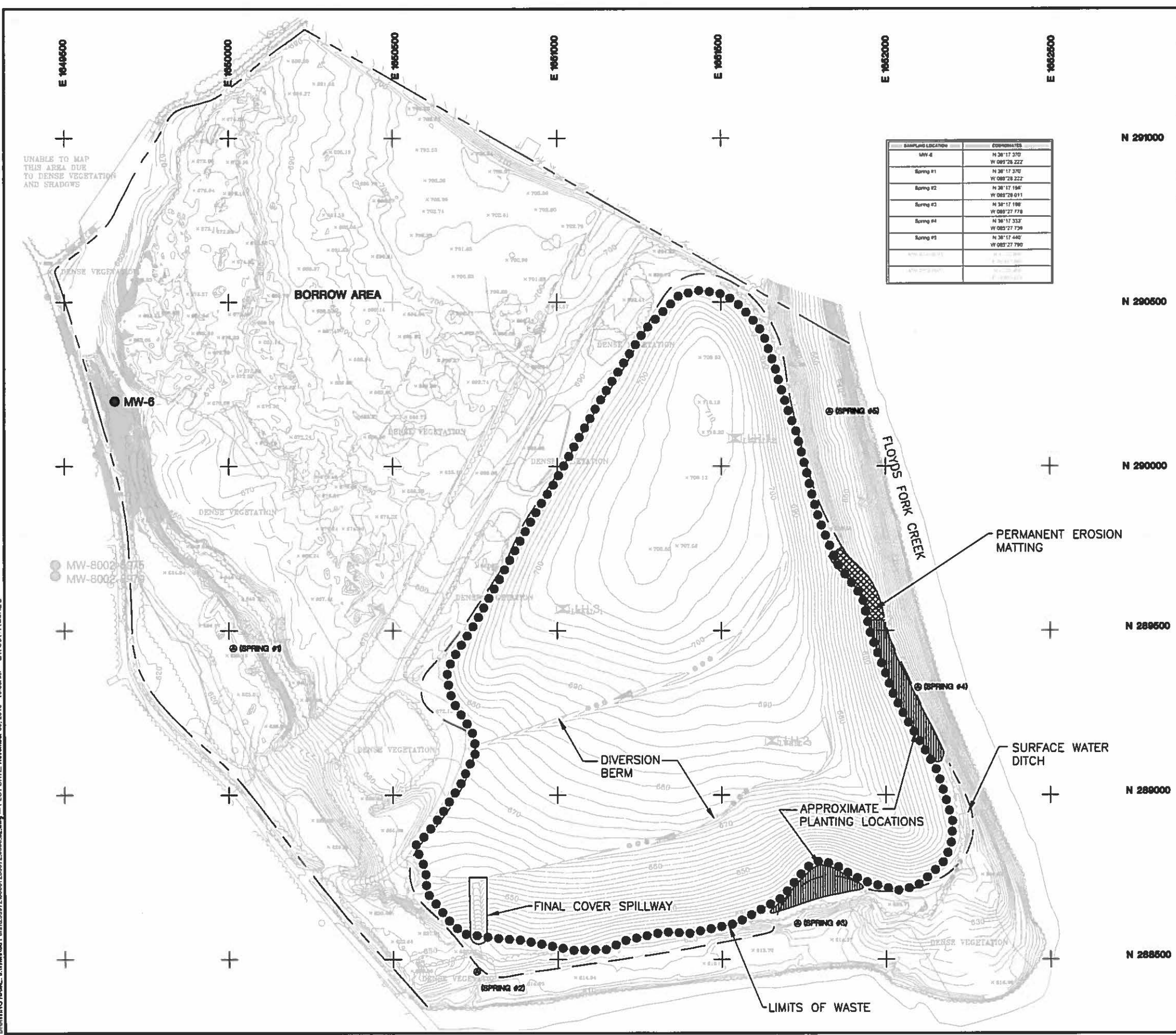
FILE:

**233972.0000.01.dwg**

**FIGURE 1**



11/17 - ATTACHED JREY'S 8/12/2000, provided - ATTACHED IMAGES  
DRAWING NAME: A:\MAR\Red Penn\2339720000\233972.0000.02.dwg - PLOT DATE: November 30, 2015 - 10:55AM - LAYOUT: FIGURE 2



SAMPLING LOCATION	COORDINATES
MW-6	N 38°17' 37.0 W 089°28' 22.2
Spring #1	N 38°17' 37.0 W 089°28' 22.2
Spring #2	N 38°17' 196' W 089°28' 011'
Spring #3	N 38°17' 196' W 089°27' 778'
Spring #4	N 38°17' 333' W 089°27' 759'
Spring #5	N 38°17' 440' W 089°27' 790'
MW-8002-8975	N 38°17' 333' W 089°27' 759'
MW-8002-8979	N 38°17' 333' W 089°27' 759'

**LEGEND**

APPROXIMATE PROPERTY LINE

GRID TICK LOCATION

EXISTING 10' CONTOUR INTERVAL

EXISTING 2' CONTOUR INTERVAL

EXISTING TREELINE

EXISTING SPOT ELEVATION

EXISTING BUILDING

EXISTING PAVED ROAD

EXISTING UNPAVED ROAD

SP-5

APPROXIMATE GEOPROBE LOCATION AND NUMBER

LH-1

ABANDONED LEACHATE HEAD WELL LOCATION AND NUMBER

(SPRING #3)

APPROXIMATE SURFACE WATER SAMPLING LOCATION AND NUMBER

MW-6

APPROXIMATE MONITORING WELL LOCATION AND NUMBER

MW-8002-8957

ABANDONED MONITORING WELL LOCATION AND NUMBER

- NOTES**
1. BASE MAP WAS DEVELOPED FROM AN AERIAL SURVEY PERFORMED BY OAS INC., ON NOVEMBER 15, 2000.

2. CONTOUR INTERVAL IS TWO FEET.

3. VERTICAL DATUM IS REFERENCED TO USGS MEAN SEA LEVEL DATUM.

4. THE PROJECT GRID SYSTEM IS PARALLEL AND PERPENDICULAR TO THE KENTUCKY STATE PLANE COORDINATE GRID SYSTEM, NORTH AMERICAN DATUM OF 1927.

5. THE LOCATIONS OF THE LEACHATE HEAD WELLS WERE OBTAINED DURING A SURVEY PERFORMED BY WESTERMAN & ASSOCIATES, LOUISVILLE, KENTUCKY. DATE OF SURVEY: MAY 19, 1999.

6. THE LOCATIONS OF MW-6 AND THE SPRINGS ARE APPROXIMATE AND ARE BASED ON COORDINATES OBTAINED WITH GARMIN GPS UNIT.

7. THE LOCATIONS OF MW-6, MW-8002-8975 AND MW-8002-8979 ARE APPROXIMATE AND ARE BASED ON A LOCATION MAP SUPPLIED BY THE KENTUCKY DIVISION OF WASTE MANAGEMENT.

PROJECT: WASTE MANAGEMENT, INC.  
RED PENN LANDFILL  
PEWEE VALLEY, KENTUCKY

TITLE: ENVIRONMENTAL MONITORING LOCATIONS

DRAWN BY: L STORMER

CHECKED BY: RW

APPROVED BY: MJA

DATE: DECEMBER 2015

PROJ NO.: 233972.0000

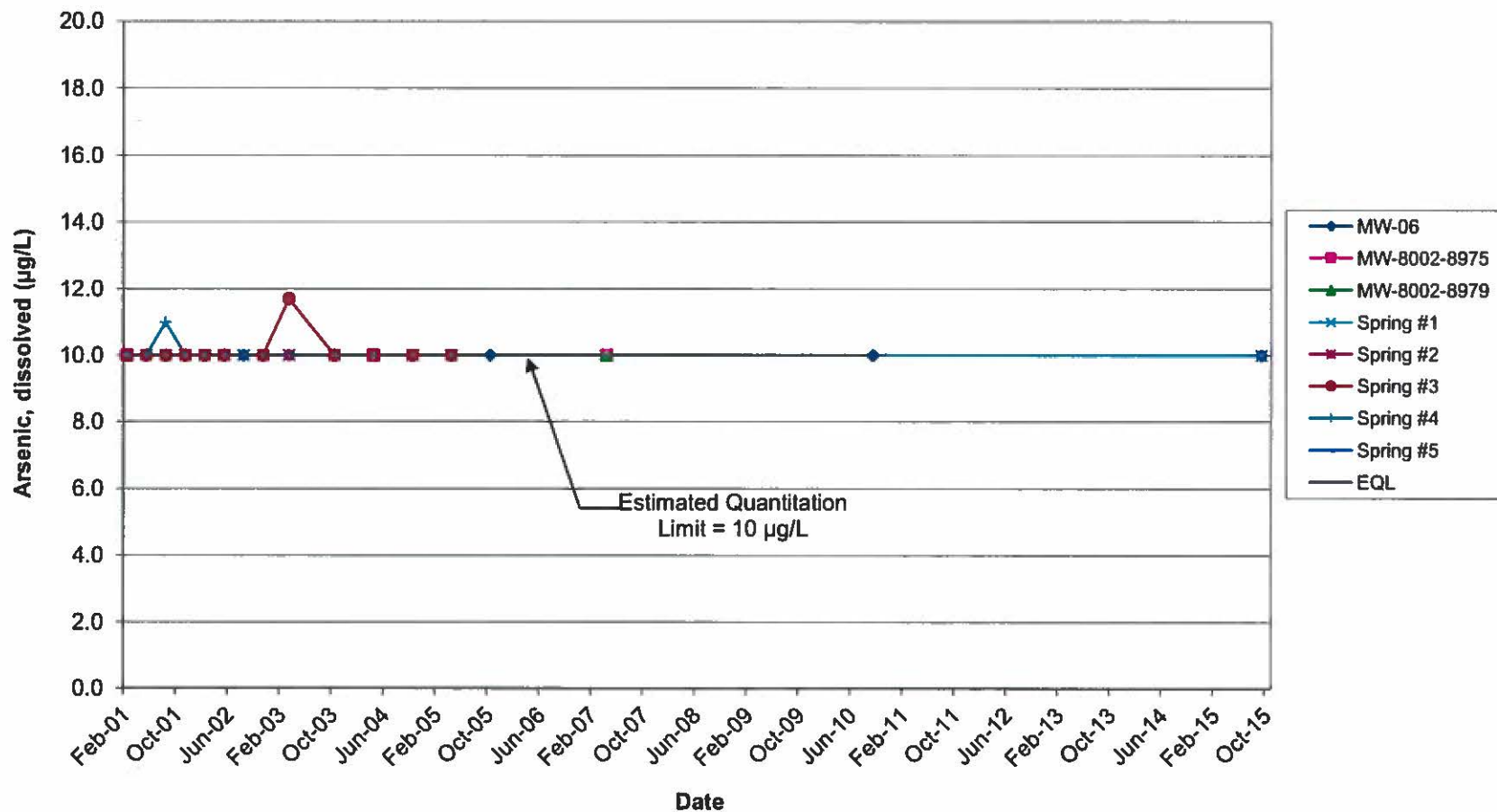
FIGURE 2

708 Heartland Trail  
Suite 3000  
Madison, WI 53717  
Phone 608.826.3600

FILE NO.: 233972.0000.02.dwg

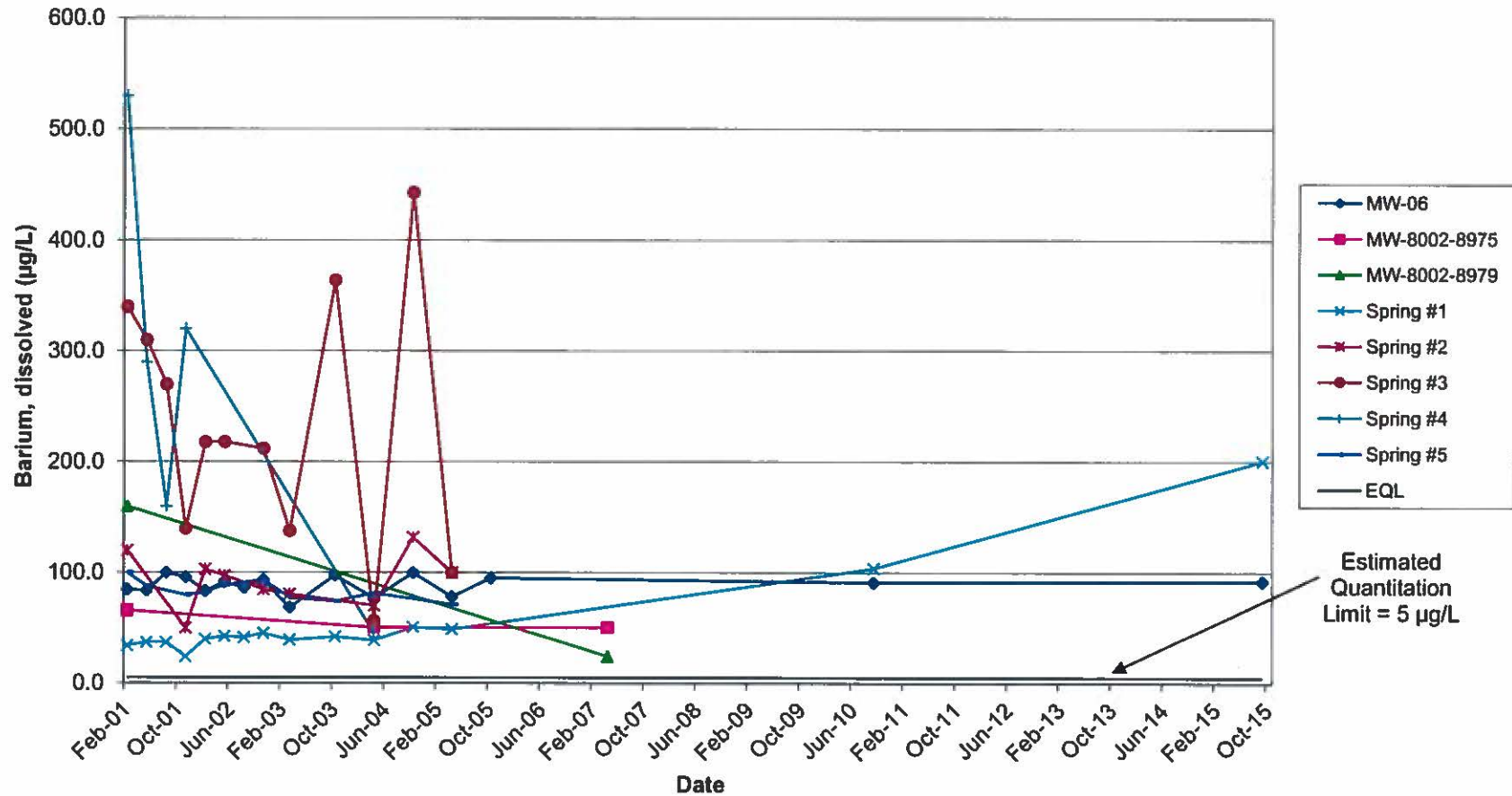


**Figure 3**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Dissolved Arsenic**  
**in Surface Water and Groundwater Samples**





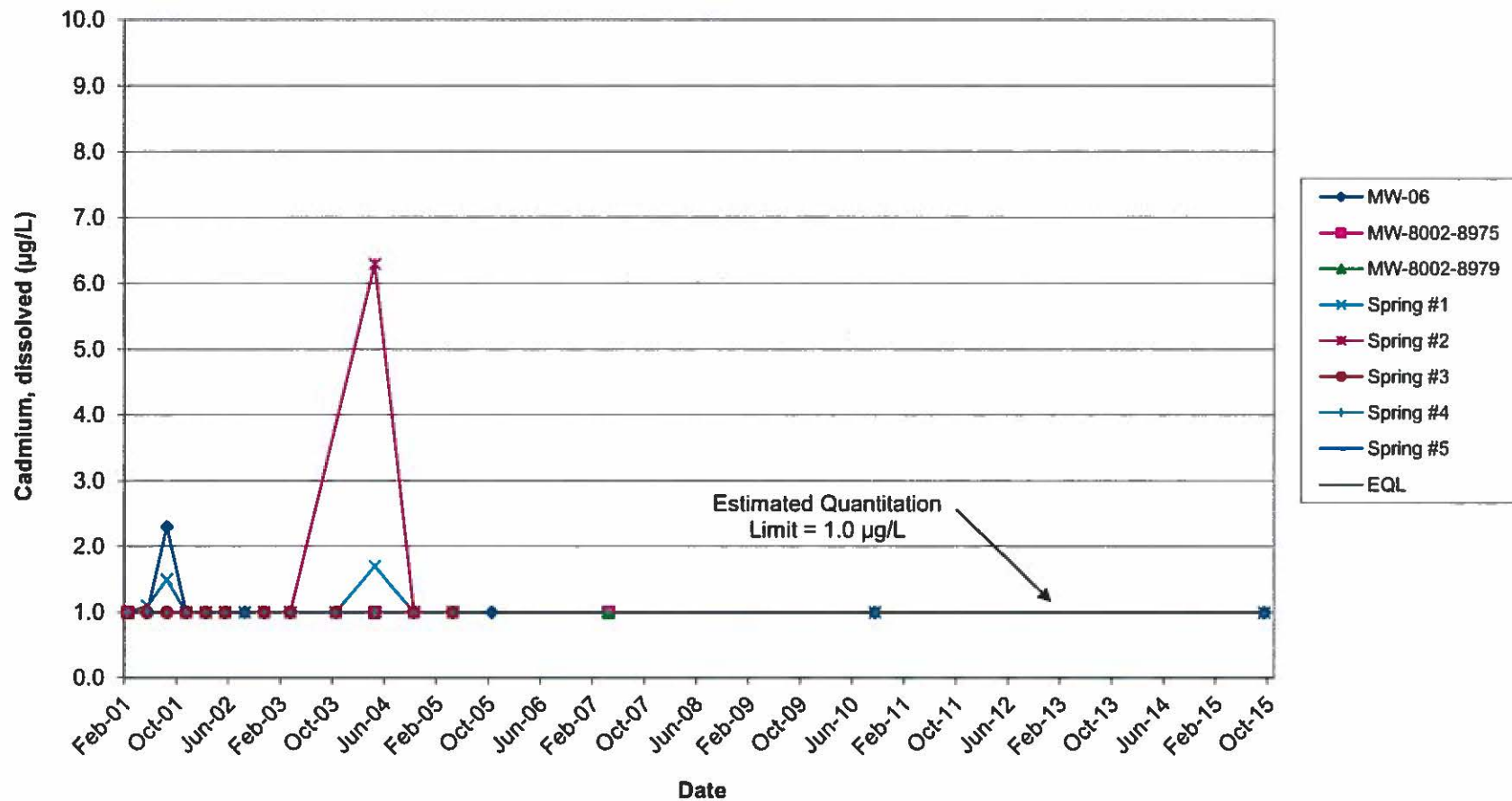
**Figure 4**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Dissolved Barium**  
**in Surface Water and Groundwater Samples**



Note: Barium was detected at a concentration of 6.8 µg/L in the field blank during the September 2015 monitoring event.

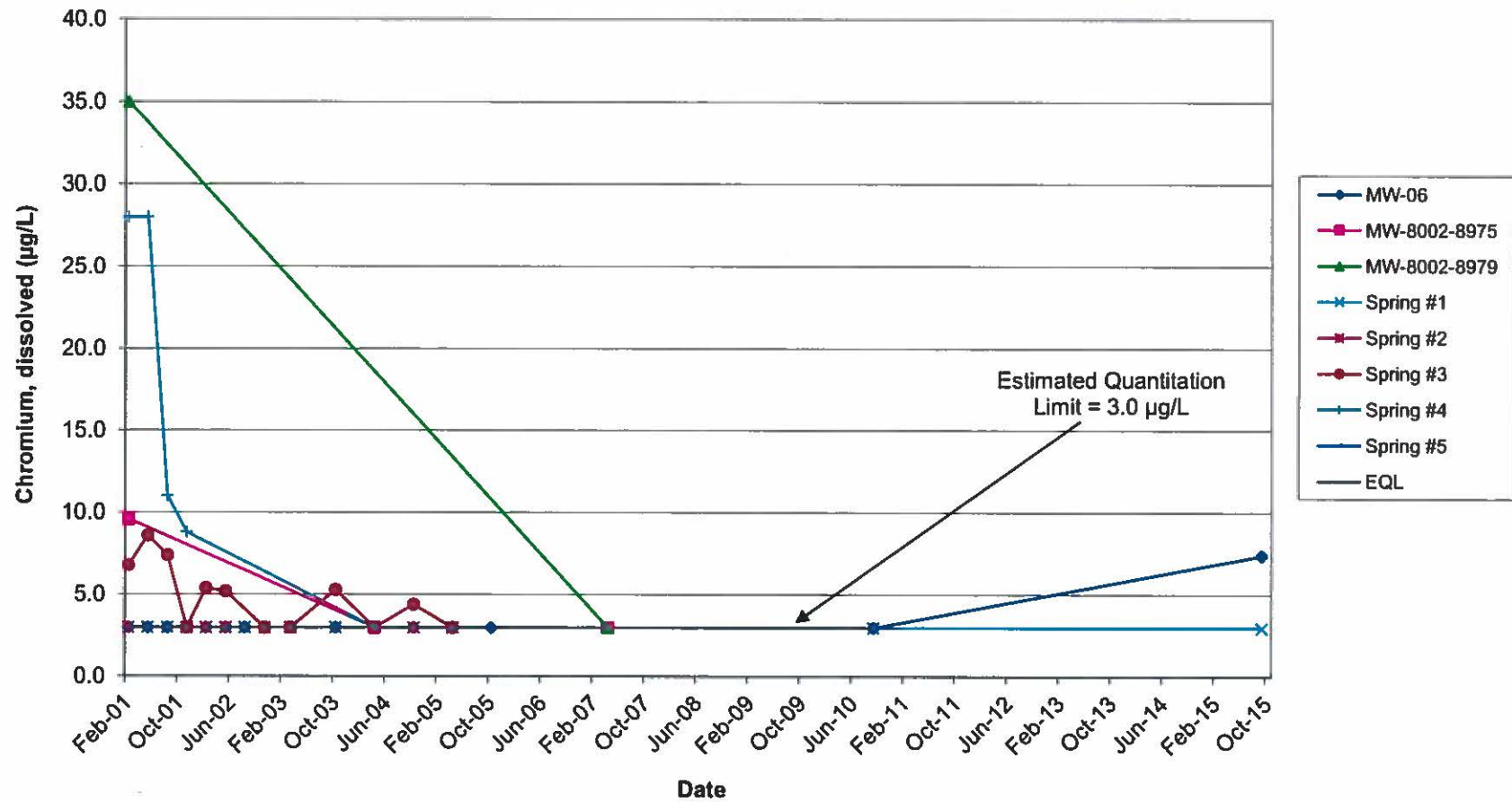


**Figure 5**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Dissolved Cadmium**  
**in Surface Water and Groundwater Samples**



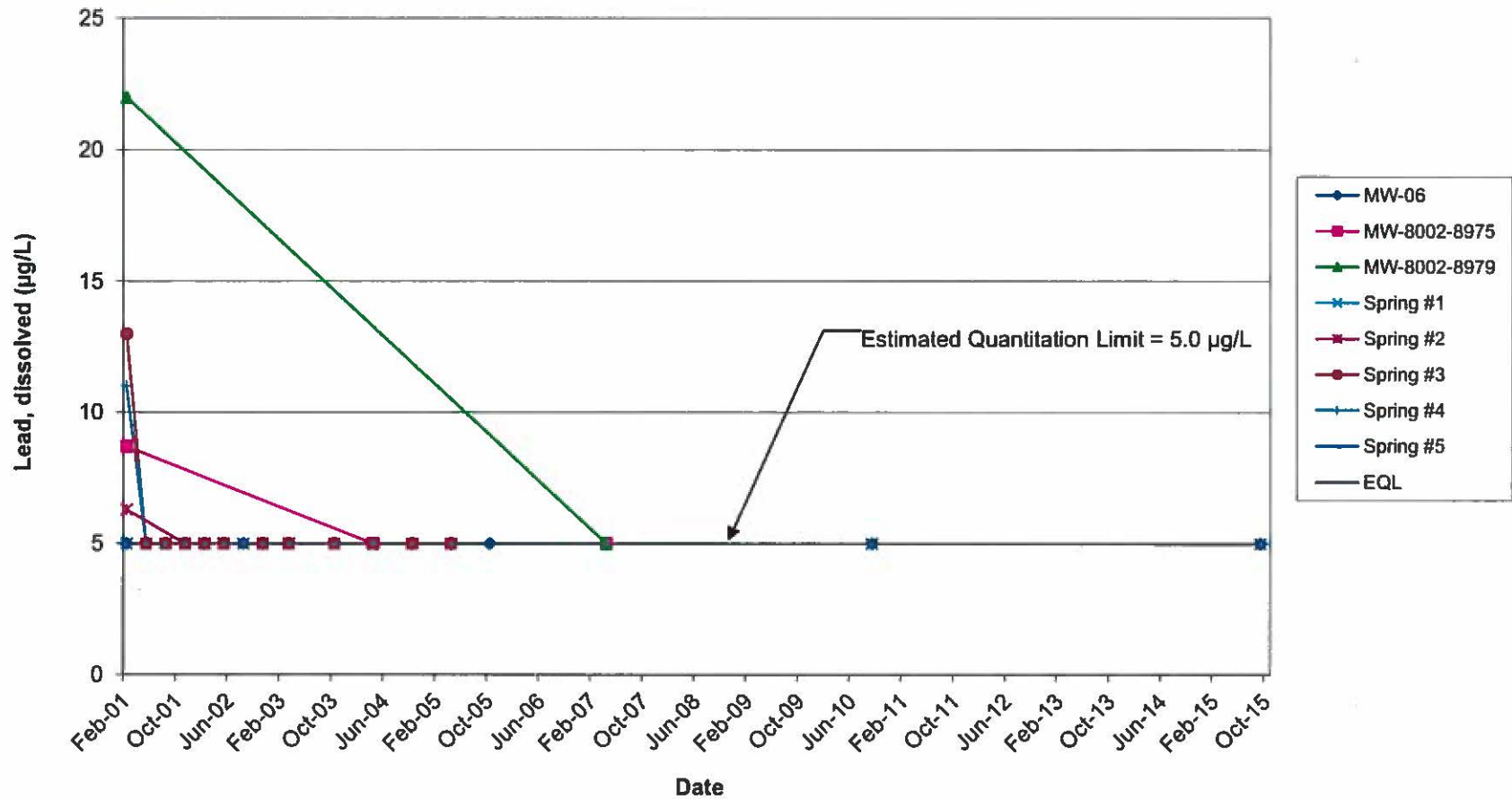


**Figure 6**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Dissolved Chromium**  
**in Surface Water and Groundwater Samples**



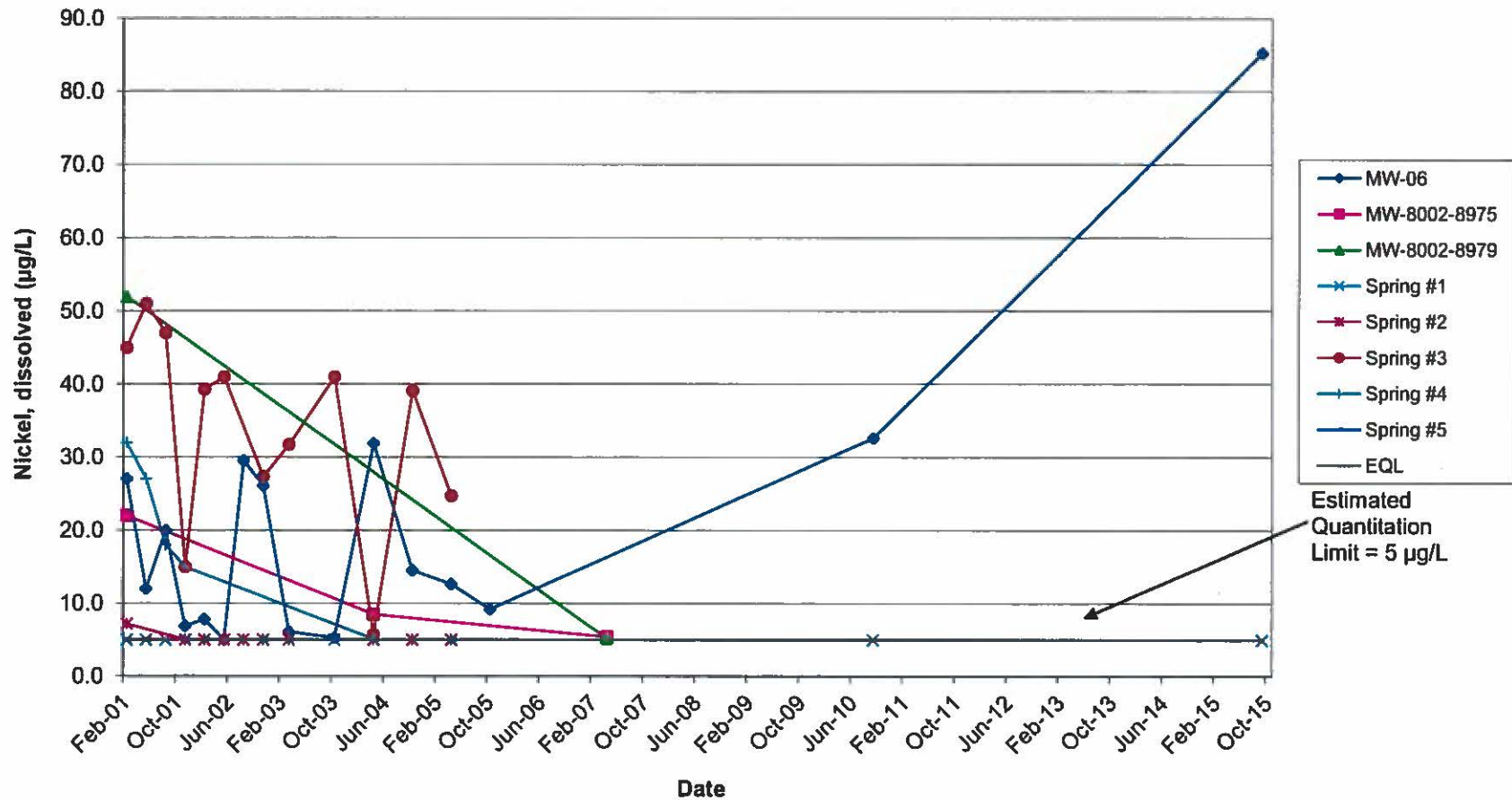


**Figure 7**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Dissolved Lead**  
**in Surface Water and Groundwater Samples**



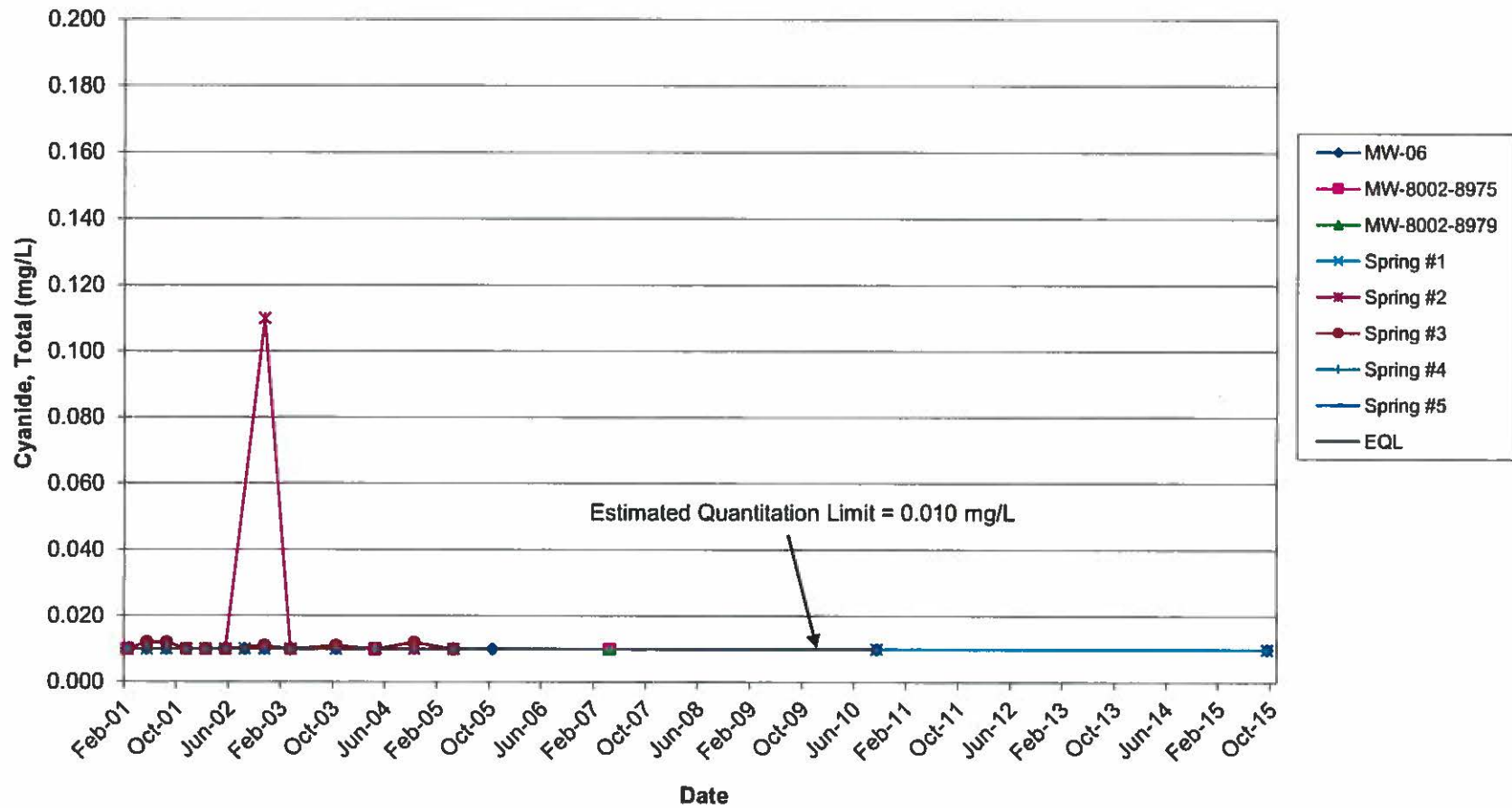


**Figure 8**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Dissolved Nickel**  
**in Surface Water and Groundwater Samples**





**Figure 9**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Post-Construction Concentrations of Total Cyanide**  
**in Surface Water and Groundwater Samples**





**Figure 10**  
**Red Penn Landfill**  
**Pewee Valley, Kentucky**  
**Leachate Head Elevations and Depth of Leachate**

